

## REMARKS

Claims 1-40 are pending in this application, of which claims 16-40 are withdrawn from consideration.

Claim 1 has been amended to remove the word “optionally” from step II(a), where the product of stage I is contacted with a deactivation agent. No new matter has been added by this amendment.

At the outset, Applicants wish to thank the Examiner for withdrawing the rejections under 35 U.S.C. §112, first paragraph.

Applicants also wish to note that in the Final Office Action dated February 25, 2005, the Examiner did not respond to arguments made regarding the *prima facie* case. The Examiner argued that Applicants attacked the references separately, however, Applicants argued against the motivation to combine the two references, or to modify the references as suggested by the Examiner. Applicants would appreciate these arguments being addressed in any reply.

### **Objections to the Specification**

Applicants have cancelled without prejudice the amendment made to the Specification, in the Office Action filed February 2, 2005. Reconsideration and withdrawal of the Objection respectfully is requested.

### **Claim Rejections**

#### **Rejection Under 35 U.S.C. § 103**

**Response to the Rejection of Claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over Govoni et al. in view of Canich et al.**

In response to the rejection of claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over US Patent No. 5,589,549 by Govoni et al. (“Govoni”) in view of US Patent No. 6,194,341 by Canich et al. (“Canich”), Applicants respectfully submit that a *prima facie* case of obviousness has not been made out by the Examiner and traverse the rejection.

In order to establish a *prima facie* case of obviousness, the Examiner must establish all three of the following essential criteria: (1) the cited reference must teach or suggest each of the claimed elements (MPEP §2143.03); (2) there must be a motivation in the cited prior art to modify the reference as suggested by the Examiner (MPEP §2143.01); and (3) the cited reference must provide a basis for a reasonable expectation for success (MPEP 2143.02). The motivation to modify and the reasonable expectation for success must come from the cited prior art and not the Applicants' specification. Further, it is not enough that a reference can be modified absent a suggestion in the cited prior art to undertake such modification (MPEP §2143.01).

The present invention relates to a multi-stage process for the polymerization of olefins comprising two sequential polymerization steps:

- (I) a first polymerization stage using a Ziegler-Natta Ti or V catalyst to prepare an olefinic polymer with a particular porosity value,
- (II) a treatment stage, wherein the product obtained in said first polymerization stage (I) is, in any order whatever:
  - (a) contacted with a compound capable of deactivating the catalyst used in stage (I); and
  - (b) contacted with a late transition metal complex, optionally in the presence of a suitable activating agent; and
- (III) a second polymerization stage, carried out in the presence of the thus obtained porous polymer on which a late transition metal catalyst is supported.

wherein the amount of polymer produced in the first polymerization stage (I) is between 10 and 90% by weight relative to the total amount of polymer produced in stages (I) and (III). Stage (I) thus prepares a support for the late transition metal catalyst as well as producing polymer.

The technical problem (see page 4, lines 14-17) to be solved by the present invention is to obviate the drawbacks which are correlated with the use of late transition metal catalysts in a supported form. The prior art teaches the use of inorganic carriers, such as SiO<sub>2</sub> or Al<sub>2</sub>O<sub>3</sub>, for the supportation of the above catalyst. Nevertheless, as clearly disclosed in the Application at page 4, lines 8-13, "the supportation on silica and alumina

of a late transition metal catalyst leads to lower catalytic activities in comparison with homogeneous polymerization reactions. Moreover, the supportation causes a substantial decrease of the branch-producing tendencies (branches/1000 carbon atoms) of these catalysts, thus leading to polymers having greater melting points and lower processability".

The novel multistage process of the invention solves the above technical problem by providing a particular technique of supportation for late transition metal catalysts. In particular, the technical problem underlying the invention is solved by means of the combination of technical features (I), (II) and (III) given in Claim 1. According to the invention, a porous olefinic polymer is used for supporting the above catalysts, as well as producing polymer. This particular heterogeneous supportation system, where the polymer made in Stage (I) is used as a support for Stage (III), facilitates achieving an unexpected increase of the catalytic activity with respect to the activities achieved in homogeneous polymerizations and in heterogeneous systems, wherein silica or alumina catalysts are used. Higher branching levels are achieved as well, which can be advantageous in that the polymer produced in Stage (III) is more elastomer-like, and therefore a better toughening agent for the polymer produced in Stage (I).

In contrast, Govoni teaches a multistage process for the polymerization of olefins  $\text{CH}_2=\text{CHR}$  comprising:

- (1) a first polymerization stage, in which in the presence of a Ziegler-Natta catalyst system, an olefinic polymer is obtained;
- (2) a second polymerization stage, in which a further polymerization is carried out in the presence of a metallocene type catalyst.

Therefore, both the Ziegler-Natta catalyst catalyst and the metallocene catalyst are simultaneously active in the second polymerization. This is completely different than the currently claimed invention, where there is no metallocene type catalyst in the second stage, and the catalyst system of the first stage is deactivated prior to the second polymerization step. The Examiner argued in the Final Office Action dated February 23, 2005 that "Govoni does generally teach that the multistage process can work with different catalyst systems in various stages to prepare a wide range of olefinic polymer composition." (page 3, line 22 to page 4, line 2). This quote is based on col. 2, lines 38-41 of Govoni. However, the

Examiner did not cite the remainder of the paragraph, where it makes clear that the two catalyst systems are not just any systems, but specifically a Ziegler Natta and metallocene catalyst system. It is well settled that the entire disclosure of a reference must be considered under §103. Ex parte Anderson, (BPAI 1991) 21 USPQ2d 1241.

Canich discloses a mixed transition metal polymerization catalyst comprising at least one late transition metal catalyst and a Ziegler-Natta or a metallocene catalyst. Therefore, it teaches a bimetallic catalyst system comprising both a late transition metal catalytic component and a Ziegler-Natta catalytic component. But Canich only teaches a single stage polymerization process and does not refer to a multistage polymerization process. As a matter of fact, Canich requires that the two catalytic components are first mixed together and then the olefin is introduced into the obtained mixture to carry out a single-stage polymerization. As emphasized in Canich, "A primary advantage of the mixed catalysts of this invention is that blends can be produced in a single reactor without the difficulties and expenses associated with an added physical blending step after production of the polymer in the reactor..." (emphasis added, column 16, lines 19-23). Further, it is clear that Canich not only does not contain any deactivation step, it cannot contain any deactivation step in view of the fact that it is a single stage polymerization.

#### **Prima Facie Case**

First, even were it permitted to combine Govoni and Canich, which it is not, the combination would not teach all the elements of the claimed invention, in that at least a deactivation of a catalyst used in a first stage, as in the presently claimed invention, is not disclosed in either reference. Canich does not have multiple stages and Govoni requires simultaneous polymerization in the second polymerization stage.

Second, it is clear that there is no motivation for a person skilled in the art to combine the two cited prior art references. Both references are silent as to the relevant technical problem, that is, the lower catalytic activity and the decrease of the branching tendency, resulting from the supportation of late transition metal catalysts on silica and alumina. Moreover, Canich teaches away from polymerizing olefins by means of a multistage polymerization process and use of a porous olefinic polymer carrier produced in the first stage polymerization, as claimed in the present invention, since the polymer formed

in the second stage of polymerization is not mixed with the polymer formed in the first stage of polymerization on a molecular level, as required by Canich. With respect to Govoni, the use of catalysts in a multistage polymerization, as disclosed in Govoni, would not generate polymer chains which "are mixed on a molecular level" as required by Canich in their polymerization by using a mixed catalyst system in a single stage polymerization. The references therefore teach away from their combination, and are therefore not properly combinable (MPEP §2145 XD2). Further, modification of Govoni to arrive at the presently claimed invention, as suggested by the Examiner, would render Govoni unsatisfactory for its intended purpose," (MPEP §2145 XD), also not permitted, since the introduction of a catalyst deactivation step, as required by the current claims, would prohibit Govoni's simultaneous polymerization of a Ziegler Natta and metallocene catalyst.

Third, no reasonable expectation of success would exist by modifying Govoni to arrive at the presently claimed invention since: (1) teaching in the art shows a decrease in activity and branching level when moving from an unsupported to a supported catalyst system; and (2) as discussed above, modifying Govoni to include the claimed deactivation step would prohibit Govoni's simultaneous polymerization with both a Ziegler Natta and metallocene catalyst, so there would be no basis to conclude any beneficial effects at all would occur.

Thus, in view of the above, any conclusion that the presently claimed invention is obvious over the cited references amounts to improper hindsight (MPEP 2145 X4).

Therefore, since none of the essential criteria for a *prima facie* case of obviousness have been established, a *prima facie* case of obviousness has not been made out. However, even if a *prima facie* case of obviousness had been shown based on the cited references, which it has not, Applicants have overcome any such *prima facie* case of obviousness by showing unexpected increased catalyst activity with an unchanged branching index, as demonstrated in Example 1 and Comparative Examples 1 and 2. Example 1 illustrates the multi-stage process of the present invention, and plainly includes the claimed stages (I), (II)(a) and (III). Comparative Example 1 illustrates polymerization in solution, and Comparative Example 2 illustrates polymerization on the silica support. The productivities of Example 1, and Comparative Examples 1 and 2 were 72.8, 41.4 and 33.4 kgPE/gNi respectively, and the branching levels were 30.2, 27.7 and

17.8 branches/1000 carbon atoms respectively. These results clearly demonstrate better productivity and higher branching in polymer made using the present process, results that could not have been predicted from Govoni or Canich, either separately or combined. In the Office Action dated July 9, 2004, the Examiner indicated that the declaration by Dr. Collina did not provide any evidence to show that the only difference between Example 1 and Comparative Example 2 is the support (page 3, lines 10-12). However, Applicants note that the declaration was directed to the question of whether the cited examples and comparative examples of the present specification were comparable for unexpected results purposes, in response to the Examiner's contention that criticality and unexpected results had not been shown because of the pressure differences between Example 1 and Comparative Example 2 (Office Action dated November 5, 2003, page 5, lines 18-22). The examples of the invention clearly demonstrate that there is an unexpected improvement in activity and branching level using the process of the invention.

Applicants respectfully request that a timely Notice of Allowance be issued in this case. Should the Examiner have questions or comments regarding this application or this amendment, Applicants' attorney would welcome the opportunity to discuss the case with the Examiner.

The Commissioner is hereby authorized to charge U.S. PTO Deposit Account 08-2336 in the amount of all fees required for consideration of this Amendment.

This is intended to be a complete response to the Office Action mailed February 23, 2005.

Respectfully submitted,

**Gianni Collina et al.**

June 20, 2005  
(Date)

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